

**CRATER LAKE NATIONAL PARK
EXOTIC PLANT REPORT
2010**

Kathryn Williams

2010 Exotic Plant Accomplishment Summary

- 2,023 acre Lonesome Burn area of Summer 2008 surveyed for exotic plants;
- North Cascade (NOCA) Weed Team visit results in treatment of all known St. Johnswort populations in the Park with Vista (herbicide), test-treatment of Canada thistle and sheep sorrel with Milestone (herbicide), the georeferencing of roadside exotics by NOCA crew, and recommendations for weed populations on the shores of Crater Lake from NOCA's Exotic Plant Management Specialist, Todd Neel;
- Organized meeting with regional botanists to discuss local exotic plant issues;
- Discussions with Chief of Maintenance and Roads Foreman regarding the re-distribution of soil, gravel and rock throughout the Park;
- The final visit of Wildlands, Inc. to pull weeds from West Highway 62 reroute areas.

This year I returned for my sixth season at Crater Lake National Park. Terrestrial Ecologist Laura Hudson, left the Park in February 2010, so by the time the two seasonal botanists came on board in mid-June, a new Terrestrial Ecologist had yet to be hired. Funding sources for special botanical projects drove much of the summer's plant-centered activities. These included continued monitoring at the permanent whitebark pine monitoring plots (year 7 data), and the establishment of *Botrychium pumicola* permanent plots to observe patterns of annual emergence of individuals: an account of those two projects will be written by Susie Roe Andersen in her annual report. Here I will report activities related to exotic plant projects in the Park.

This year's exotic plant activities were dominated by two major projects/events. We had the funding for a Weed Team from North Cascades National Park ("NOCA") to come and treat St. Johnswort this year, in addition to participating in other invasive plant activities, described later in this document. NOCA Weed Team supervisor, Todd Neel, also had the opportunity to visit weed sites on the shores of Crater Lake in order to provide some recommendations for developing a Weed Management plan specifically for the Lake area. The second large project was surveying the Lonesome burn area with the aid of a botanical team

on loan from Lassen Volcanic National Park (LAVO). These activities and other invasive plant issues related to Summer 2010 will be more fully described later in this document.

At the beginning of the season, I organized a meeting of regional botanists to discuss weed issues we face on the job, what strategies we are applying, and which courses of action have been effective. Furthermore, I also became aware of potential weed spread issues connected to road maintenance and trail activities which I will discuss further on in this report.

As in previous years, I continued to monitor and hand-pull all noxious weeds found (including Hypper plants that had missed treatment). All occurrences of noxious weeds, regardless of the population size, are georeferenced and formally documented using our “Non-Native Plant Assessment” forms. All significant (i.e., with more than 5 individuals) patches of less invasive weeds are documented on “Non-Native Plant Assessment” forms (see small 3-ring binders) and entered into the Exotic Plant Database (**S:\RM\Terrestrial Ecology\all to 2010 EXOTICS\Exotic Plant Database**, with a copy on the vegetation desk computer **C:\ drive at C:\Kathryn**). The unique number for each plant entry is hand-written on the bottom right corner of each entered datasheet. **All 2010 GPS data collected used a NAD83 projection.**

I also worked on projects, not related to exotics:

- Assisting Susie Roe Andersen with the installation of *Botrychium pumicola* long-term monitoring plots;
- Re-reading Whitebark Pine Monitoring Plots;
- Informing the FMO of resource concerns in lightning strike areas;
- Developing a field guide for differentiating *Boechera* (formerly “*Arabis*”) species found in the Park, using the information derived from Linda A. Vorobik, as it now appears we have an extremely rare species of this genus in our Park, and it is a difficult genus to key to species.

ROAD WORK AND QUARRY ISSUES: Conversations with Maintenance

This year I got together with Matt Schaeffer (Roads Foreman) and Don Tyree (Chief of Maintenance) to discuss their plans for the Yards/Quarries (e.g., South Yard, Pole Creek Quarry, Anderson Bluffs). Maintenance is in the process of coming to terms with numerous piles of materials, from burned campfire piles to gravels and rock piles of various origins, ages and sizes, that have been dumped over the years in various yards around the park. It is their long-term goal to *get rid* of any piles/ stored artifacts that they will not be re-

using, and to *organize* any piles that they plan on re-using. Matt also has plans to take the boulders, rocks and gravel from rockfall in the Park, to sieve and sort these materials for re-use in roads, trails and other Park projects.

For Resource Management, we need to be sure that Maintenance is using weed-free areas for the storage of materials (e.g., the storage of sand in the South Yard for icy winter road dispersal), and that current stored piles of materials are surveyed early every summer for weeds. Patches of weeds were delineated this year in Anderson Quarry and the South Pole Quarry so that maintenance personnel could let these areas “rest”, until we can guarantee that weed seed “sleeping” in the soil will not be spread to other locations in the Park. Furthermore, the materials that Maintenance has been sifting and sorting in the Pole Creek Quarry from the Rim Road ditch and rock cliff project this year has some weed seed in it, as they dug out some ditch areas with small patches of St. Johnswort. **NO MATERIALS IN POLE CREEK QUARRY SHOULD BE REDISTRIBUTED THROUGHOUT THE PARK UNTIL IT CAN BE CLEARED FOR WEEDS NEXT YEAR.** I know that yellow rocket (*Barbarea vulgaris*) seed still lurks in the materials there, and there is the potential for St. Johnswort to appear next year from the ditch scraping project of 2010. Maps and excerpts of correspondence with Maintenance can be found in the Appendix section.

Table 1 . Locations of Known Weed Patches in Quarries (in NAD 83).

Location	Site Description	Easting	Northing	No. Plants Pulled in 2010
Pole Creek Quarry, Site 1	Flat area next to woods in the south part of yard, approximately 20' x 20', sparsely populated with yellow rocket	0569215	4743848	Contaminated soil was scraped and mixed with other quarry materials before pulling crew came. (There were an estimated 30 – 40 yellow rocket)
Pole Creek Quarry, Site 2	Flat area at west end of yard behind a 20' high asphalt pile, area approximately 10' x 12' scattered yellow rocket throughout	0569177	4743969	180 yellow rocket
Pole Creek Quarry, Site 3	Ash/trash pile approximately 5.5' tall at the west end of the quarry; materials from Mazama Campground; discrete but dense yellow rocket	0569176	4743945	220 yellow rocket

Anderson Bluffs Quarry, Site 1	7' tall mound of mixture of coarse and fine materials, back from old road, but still visible, supports a discrete but densely populated patch of yellow rocket	0576661	4750573	833 yellow rocket
Anderson Bluffs Quarry, Site 2	Further along old road than Site 1, a 10' x 12' flat up into pumice rock pile, next to old road, patch of yellow rocket	0576709	4750707	177 yellow rocket



Figure 1. Pole Creek Quarry Site 1



Figure 2. Pole Creek Quarry Weed Site 2.



Figure 3. Pole Creek Quarry Weed Site 3.

ROADSIDE WEEDS

St. Johnswort (*Hypericum perforatum*, or “Hypper”)

Roadside. In July 2007, Oregon Department of Agriculture employees (ODA) began what became annual applications of the herbicide “Vista” to St. Johnswort plants found on Hwy 62. In 2010, a weed team from North Cascades came to treat St. Johnswort in the Park, as they were slated to perform other weed-related duties. Over the years, I have consistently counted Hypper treated in the Panhandle in order to arrive at an annual reduction estimate. Pre-treatment (2007) Hypper densities in the Panhandle were estimated at 2,630 individuals; three years later, we have more than 90% fewer plants. The following table details our success:

Table 2. Panhandle St. Johnswort Densities by Year.

Year	Number of Plants
2010	234
2009	600
2008	958
2007	2,630

Spotted Knapweed

The only known patch of spotted knapweed in the Park has diminished greatly over the years thanks to diligent annual hand-pulling efforts (Table 3).

Table 3. Number of Spotted Knapweed Plants Pulled in North Panhandle.

	2006	2007	2008	2009	2010
East Side of Road	90	16	30	10	2
West Side of Road	231	126	72	8	0

In order to be *most* effective, one has to visit the site multiple times in a given summer: once to scope out the phenology of the plants (you want to pull this before seeding begins); then return to the site to pull all plants before any go to seed; and finally visit a few weeks later to pull any late-emerging individuals. **My recommendation for 2011 is to continue making multiple visits in an attempt to hand-pull all plants from this population; this patch is nearly eradicated.**

Wildlands, Inc. – Hwy 62 Re-route

In 2006, portions of West Highway 62 were re-routed and otherwise adjusted. In some of these areas (see Table 4), exotic plants have emerged. Wildlands, Inc. has taken responsibility the past four seasons for sending a couple of field personnel to pull these weeds. Lisa Vogler at WildLands, Inc. was my contact person in the Washington office [phone # (800) 288-8328].

On August 3, 2010, Spencer Blodgett returned for the fourth straight year to remove roadside weeds from West Highway 62 revegetated re-route areas. This year he came with one assistant, and weed removal took less than a day. Spencer did not take precise counts while pulling weeds, but estimated after the fact that they had extracted:

- 200 *Chenopodium album* (lambs quarter)
- 150 *Verbascum thapsus* (common mullein)
- 50 thistles (I assume bull thistle, given information from previous years)
- 25 non-native mustards of unknown species
- 100 *Trifolium repens* (white clover)

Although I have never personally fully surveyed these areas for weeds, I have walked through the units just before the Wildlands Inc. visit, and I would guess that the aforementioned numbers were an over estimate, and that in 2011 when Crater Lake takes over the exotic plant removal, that it would take two persons a half a day to survey and pull.

Table 4. Revegetated West Hwy 62 sites where WildLands, Inc has come to pull weeds.

Site Number	Description	Distance East from Old West	Corresponding UTM's (Zone 10, NAD 83)
1.	Old West (bathroom)	0.0 miles	0559950 E 4749927 N
2.	At a paved pullout, reveg on both sides of road	0.6 miles	0560897 E 4749434 N
3.	On a straight-away, both sides of road, can see little tagged trees	3.0 miles	0564259 E 4748120 N
4.	Corkscrews	4.6 miles	0566134 E 4747851 N

The following is a response to an email request I put forth in 2009 to Lisa Vogler of Wildlands, Inc. and her antidotal responses (my questions are italicized; highlighted portions are key points). This will help us in taking responsibility next year:

Kathryn,

To answer your questions as best we can:

1) Of the four areas (Old West, Paved pullout - west, straight-away roadside - east, and the Corkscrews), were there any areas that never had any weeds? Any that were "weed-free" this last visit?

-There were definite areas that were "weed-free", from the beginning – namely those areas that did not receive artificial topsoil application. Unfortunately, these areas were never mapped, so the way we were able to identify the artificial topsoil areas was looking for the vermiculite, which pinpoints the artificial topsoil. Basically, those areas are on **both sides of the Corkscrews, the paved pullout, and the Old West location. There were weeds in all of these areas.**

2) Of the four areas, were there places of higher weed concentration (e.g., in referring to the lower Corkscrews area, could you please specify between east and west sides of the road)?

-Spencer said that the **upper Corkscrews** area (where the northernmost road obliteration took place) **was where they found almost all of the mullein. Other areas they only found Lambsquarters.** He didn't notice particular places of high concentration, but did say that it seemed like the Lambsquarters were coming up in the same locations a previous years. That is, you could see little concentrations of seedlings in areas where it looked like we pulled weeds out of those spots during previous visits.

3) Could Spencer hazard a rough estimate of how many weeds were found in 2009?

-Spencer **estimated maybe 100-200 individuals each of the Mullein and Lambsquarters (400 total, maximum)**

4) Did they find any Trifolium repens or Cirsium vulgare this trip?

-In the past, we have found an occasional thistle rosette, which we pulled. Spencer said they found maybe 4 or 5 during the last visit, a few on the lower switchbacks area and a couple by the Old West site. We never saw any adults, so could not identify the species for certain. As far as the clover, I don't recall seeing any the first year. Spencer is not a botanist, so would not have known to look for the clover specifically, and I did not see it the first year so didn't tell him to look for it. I guess my point is, there could be *Trifolium repens* on the project area that were not targeted.

NORTH CASCADES WEED TEAM VISIT

The North Cascades ("NOCA") Weed Team, led by Exotic Plant Management Specialist Todd Neel [(360) 854-7336] worked at Crater Lake National Park from July 29 through August 4, 2010. The team, consisting of six NOCA employees, were given maps and a priority list of weed-related projects to complete during their five days at the Park. As of December 2010, we are still

waiting for final documentation from NOCA: a written recommendation on how to approach our noxious weeds on the shores of Crater Lake; GIS maps showing herbicide treatment locations by species; and a GIS map showing us all untreated weeds the team came across as they walked the length of Highway 62 and Munson Valley Road.

The following are the accomplishments of the NOCA Weed Team:

- Walked all of Highway 62. Treated all Hypper with Vista. Treated sheep sorrel (*Rumex acetosella*, or “Rumace”) with Milestone at the southern Panhandle boundary and on the first mile of Highway 62 in the Panhandle test-treated Rumace with Vista – the remainder of Rumace in the Park was left alone.
- Georeferenced all recognized weeds, even untreated ones, while walking Highway 62.
- Test-treatment of Canada thistle (*Cirsium arvense*, or “Cirarv”) at Spruce Lake and on one patch in the lower Panhandle.
- Walked Munson Valley Road and treated Hypper with Vista.
- Treated St. Johnswort with Vista in other sections of the Park (see “Outlier Treatment Locations” maps in the Appendix).

Results from these treatments will be examined next summer and will be a part of the 2011 Exotic Plant Report. Until then, please see the Appendix for maps of where CRLA asked the NOCA team to treat weeds, along with supporting documentation.

CRATER LAKE SHORES

Last year was the first year we were able to get an idea of the extent of our exotic plant problems down on the shores of Crater Lake by surveying the lake’s entire circumference, and combining that knowledge with the 2007 information from our survey around the shores of Wizard Island. We learned that we had approximately 900 Canada thistle plants scattered throughout the caldera, though most plants were concentrated on the Watchman bench (the place where the first seed likely germinated years ago). We also learned that diligent efforts to pull bull thistle seems to have paid off, though getting to the scattered bull thistle locations annually is time-consuming for the research boat crew (who has a very full summer schedule), and we can’t always secure the boat for this purpose each year before seeding time. There is one known patch of common mullein which will have to be visited each year or two for

hand-pulling (mullein seeds can live longer than 100 years). Finally, there is one area where non-native St. Johnswort grows. This population is well-established and has grown up a steep wall, so an accurate density estimate and future treatment is problematic.

This year, we had time for two visits down on the Lake. The first was to show NOCA weed specialist Todd Neel what we are up against as our situation on the lake shore is so sensitive, difficult to navigate, and in short, unique. We did no hand-pulling on this trip, but rather showed him around so he would have enough information to give us some management recommendations. The second trip occurred in late August, where a group of folks helped me to pull weeds along the Watchman bench. We had one day only for pulling, so in order to maximize the amount of weeds we could pull, I did not have anyone georeference plant locations, rather, I had them count the number of individuals they pulled at each patch location. A group of men began the northernmost part of the weed-pull at the bluffs, just south of the Devil's backbone: they worked their way south; a group of women began the pull at E 0568203, N 4753664, and worked their way north towards the men. A total of 341 Canada thistle plants and eight bull thistle plants were pulled that day. To illustrate patch-size frequency, Table 5 demonstrates that the lakeshore supports many small (less than 11 individuals) patches, and fewer large ones. Smaller patches are likely less well-established, and in future, may respond more quickly and effectively to treatment.

Table 5. Number of patches found and pulled, by species, Watchman bench, August 18, 2010.

Number of individuals in patch	Cirsium arvense (Canada thistle)	Cirsium vulgare (bull thistle)
1 to 10	26	3
11 to 20	6	0
21 to 30	1	0
31 to 50	1	0
51 to 60	1	0

MEETING WITH NEIGHBORING BOTANISTS

On July 7, Leah Lentz, the new Exotic Plant Specialist for Rogue River National Forest, and Fremont-Winema National Forest Ecologist Sarah Malaby came to Crater Lake National Park to discuss exotic plant issues. Sarah shared the following:

- The Klamath district has Klamath weed and non-native hound's tongue;
- Fort Klamath area has dalmation toadflax;

- On our north end (Hwy 138), there aren't too many weeds, mostly Klamath weed and knapweed.

In addition to those weed issues, Sarah left us with a report on a rare butterfly, "Leona's blue butterfly", and asked that we let her know if we see this very rare species.

Leah let us know that the following weeds are showing up in neighboring Rogue River National Forest:

- Purple loosestrife is showing up in Prospect along lake/highway 62 (near big bridge)
- Ox-eye daisies
- Hound's tongue
- Tansy ragwort (on the Umpqua divide)
- Toadflax

This information brings me to the following recommendations:

1. We need to take a careful look down in the Panhandle at hound's tongue. I have identified native hound's tongue in the panhandle near the southern border, but we need to take a closer look and make sure we are not being invaded by the non-native variety.
2. The last three years, single occurrences of dalmation toadflax have been popping up along the roadside of south highway 62. Each summer we need to be diligent to keep an eye out for this invasive species, as once a patch is established, it is very hard to eradicate.
3. We need to be sure that the botanical staff, and roads staff are familiar with our most troublesome weeds. It is a short list of weeds, so this could be accomplished fairly easily.

The meeting was a chance for us to get to know one another and better network. Since our meeting, we have contacted one another several times to pass along new information. Our neighboring botanists are a great resource for local programs and issues.

LONESOME BURN UNIT

Objectives

The primary objective of this project was to thoroughly survey for the first time in the Park's history, a recently burned area of the Park in order to examine the abundance and species distribution of weeds therein, and to control the non-

native plant populations found during the survey. This is an important piece of information for understanding this and other unsurveyed areas of the Park, as the majority of our exotic plant work has been conducted along roads and in high visitor use areas. Terrestrial Ecologist Laura Hudson secured funding for this project through BAR monies; this is year two of a three-year funded project.

In 2010 we were able to re-approach the Lonesome burn unit, taking note of our 2009 attempt to inventory (instead of *survey*) the entire burn area within the Park boundary. In learning our lessons of looking in too much detail, in 2010 we took a different approach, taking into account advice from Montana State University's Inventory and Survey Methods for Non-Indigenous Plant Species (Rew and Pokomy, 2006), our regional Fire Ecologist Calvin Farris, and Lassen Volcanic National Parks Ecologist, Janet Coles.

Site Description

The Lonesome burn area in Crater Lake National Park is located in the southwest corner of the Park, and it borders the Rogue River National Forest to the south and west. It covers approximately 2,023 acres on the southwest slopes of Union Peak, dipping steeply south into Red Blanket canyon. With little exception, the high intensity burn areas surveyed consisted of stands of defoliated snags with bark beginning to peel off of boles. It was quite easy to navigate though these areas this year, nearly two years post-fire, but in the next several years, these sizeable patches will become far more difficult to traverse as the standing dead succumb to gravity and the fuel load increases dramatically. The landscape in general is very hummocky with occasional rocky outcrops.

The southern boundary parallels the Red Blanket Falls trail on Forest Service land, and the slope increases dramatically and unnavigatably north into the Park. A majority of the weeds found in the burn unit occurred in a steep, brushy area on a south-facing slope where the dominant species were *Garryea fremontii* (silk tassel) and *Rubus ursinus* (California blackberry), with occasional *Quercus kelloggii* (black oak). The majority of the estimated 2,023 acres, however, supports a "climax" mixed-conifer forest, including *Abies magnifica* var. *shastensis* (red fir) and *Pseudotsuga menziesii* (Douglas-fir). The polygons of high burn intensity were primarily snag fields with many seedlings, predominantly fir, growing beneath. Understory species seen regenerating in these areas include, most notably, bleeding heart, dogbane, three species of *Carex*, *Ceanothus velutinus*, and *Vaccinium scoparium*. Also striking near these polygons were the presence of "bioislands" of green, none larger than an acre, consisting primarily of lupine and needle grass.

The roads leading to the Park boundaries surrounding the survey area all occur on USFS land. Patches of St. Johnswort sporadically line sections of the roads leading to the Lonesome burn. These patches are not yet thick and creeping backing into the forest, but they are numerous.

FIRE BACKGROUND

The Lonesome Complex initially began on August 23, 2008 after a dry lightning storm passed through an USFS wilderness area south of Crater Lake National Park (CRLA). It began as three separate fires with a total of twenty-two acres in the Fremont-Winema National Forest called the Middle Fork Complex which then combined with the Lonesome Fire in the Sky Lakes Wilderness area. All the fires were being managed as Wildland Fire Use operations. Around September 14 – 16 2008, an east wind event occurred causing the fire to jump Red Blanket canyon and enter into the park boundary. It was determined by the park superintendent that the park did not have the resources to manage this rapidly growing fire and that full suppression was needed. A Delegation of Authority was signed on September 19, 2008 and full management of the now named Lonesome Complex was turned over to a Type I Incident Team.

Final fireline rehabilitation efforts were completed on October 2, 2008 for the entire Lonesome Complex (21,125 acres) including the 2,023 acre section in CRLA. However, the Rogue River National Forest resource manager alerted the park ecologist that the USFS would be requesting a BAER team to address invasives that were found in the helibase and camp parking area, but they were also concerned with other known invasive plant populations that occurred alongside much of the burned area perimeter. In addition, the old growth mixed conifer (red fir, douglas fir, western hemlock) found in this area of the park had not burned in recent history (>100 years) and is now surrounded by clearcuts on the west side and a horse/hiking trail on the south side. With this combination of disturbance and potential dispersal mechanisms nearby, the probability was high that invasives could get a foothold in the park without immediate intervention. Thus, the park requested BAR funding to implement a systematic invasive survey and monitoring protocol with funding for appropriate weed treatment as needed.

Methods

We used the Inventory and Survey Methods for Nonindigenous Plant Species publication from Montana State University as our model. Given the amount of time and personnel we had to complete the project, our approach was to survey thoroughly (with approximately 90% chance of detection) areas with a higher likelihood of weed occurrence throughout (i.e.: high intensity burn patches as delineated from aerial fire severity GIS raster data provided by Calvin;

boundaries shared with US Forest Service; and hand-lines). Then to cover the remainder of the burn area, we generated 15 random points (low to moderate severity areas) from which we walked 0.25 miles in a randomly generated direction, looking for weeds. In addition to these survey methods, you can see how in getting from one project area to the next in the Lonesome unit, we covered a lot of additional ground, which is when we discovered some of our weeds (see GPS Tracks map). The southern-most extent of the burn areas was too steep to safely navigate, but crew members were able to get pretty far down slope.

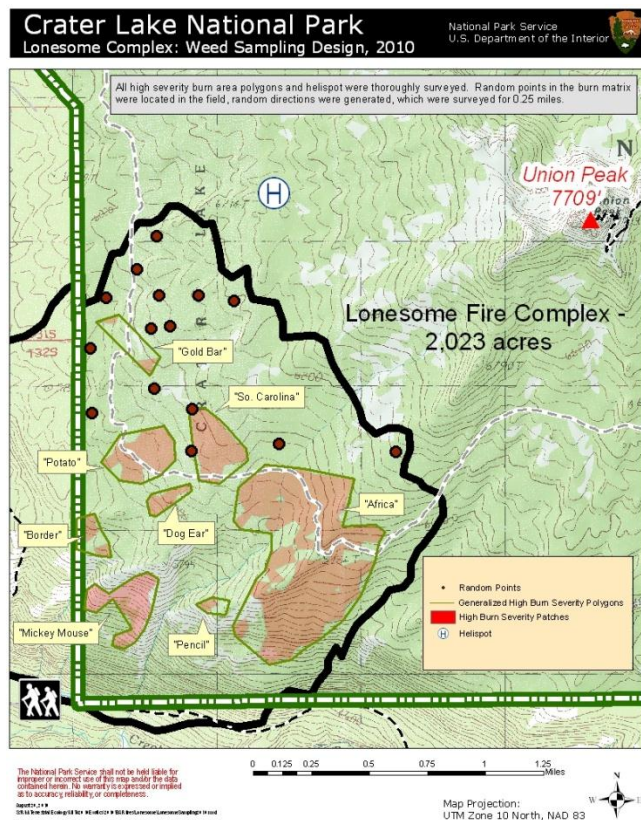


Figure 4. Survey areas and location of fire perimeter in Crater Lake National Park, with USFS boundaries delineated in green.

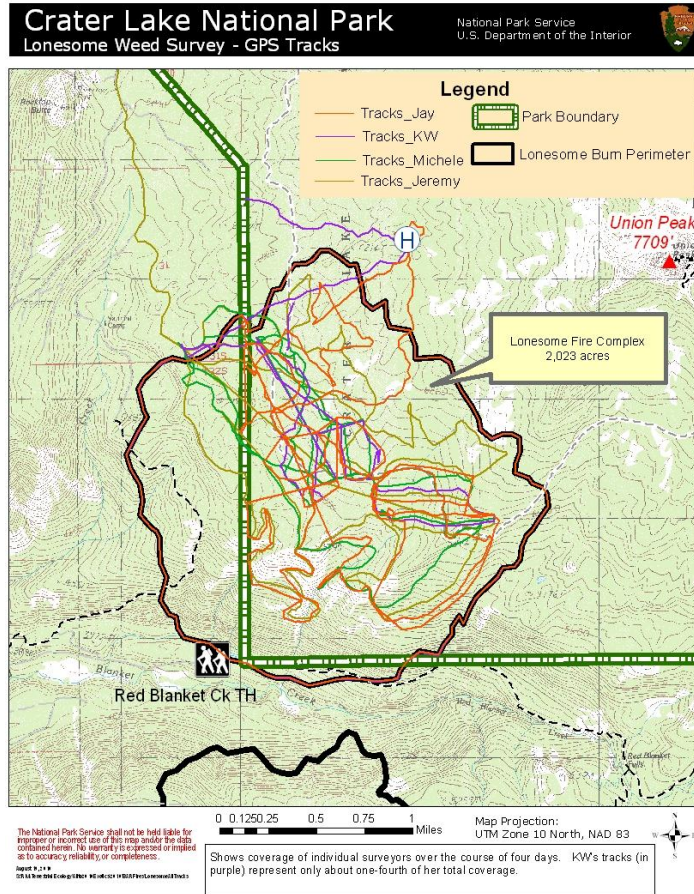


Figure 5. Area covered by surveyors throughout the surveying process.

Beginning August 10, 2010, a crew of five began surveying the Lonesome. Chris Wayne, the Park GIS specialist, created generalized polygons in order to lump together some smaller high severity patches to create areas large enough to survey. We excluded areas that were too steep to safely navigate, and high severity patches that were too small and isolated to include into a larger high severity survey polygon. This left us with eight polygons to intensively survey (see Weed Sampling Design map for their locations). We surveyed by collectively gridding ourselves out along polygon edges, with each surveyor following the same compass bearing. Our swath distances varied according to terrain and vegetation, where we felt 90 percent confident of finding a mature weed. (The main weeds we expected to find were bull thistle and common mullein). The fifteen 0.25 mile transects followed a random compass bearing. When found, whether in an official survey area or not, the location was georeferenced using Garmin GPS units (data collected in NAD 83), number of plants, growth stage and any additional information of interest. By week's end, all high intensity burn polygons were surveyed, which left the random point sampling of the matrix, fireline and boundary for the following week.

A majority of the weeds found were on steeper south-facing slopes less than 0.5 miles from Forest Service boundaries. However, few of the plants were actually found inside our high intensity burn polygons, but rather just outside of them, and more frequently near ephemeral drainages; this information may aid us in future burn area surveys. A majority of weed locations seemed to be random occurrences of a single plant, thistle perhaps carried by the wind, common mullein most likely carried in by a bird or boot tread.

Table 6. Weeds found in or near the Lonesome Burn Area, August 2010.

Species	# of Plants	Northing	Easting	Comments
Bull thistle	1	4740881	0559551	On USFS land, just west of boundary.
Common mullein	1	4741485	0559936	On USFS land, on boundary with Crater Lake National Park.
Common mullein	1	4740081	0559965	Just east of CRLA west boundary line.
Bull thistle	3	4739950	0560113	Growing near the head of a spring; in "Mickey Mouse" polygon.
St. Johnswort	20	4739531	0560449	Cluster of 20 growing in shrubfield, full sun; in "Mickey Mouse" polygon.
Bull thistle	1	4739336	0560399	Large 2 nd year growth, many flowers; full sun in "Mickey Mouse" polygon.
Bull thistle	4	4739408	0560498	Growing in moist soil on the tributary of a large drainage; some shade.
Common mullein	2	4749646	0570524	2 nd year growth, large; on small tributary of large drainage; in shade, moist.
Common mullein	3	4741885	0559822	USFS land, west of CRLA boundary.
Bull thistle	1	4740227	0561148	Small, first year plant on a semi-rocky toe slope.
Common mullein	1	4740933	0560636	Found between "So. Carolina" and "Potato", approx. 15' SW of old road.

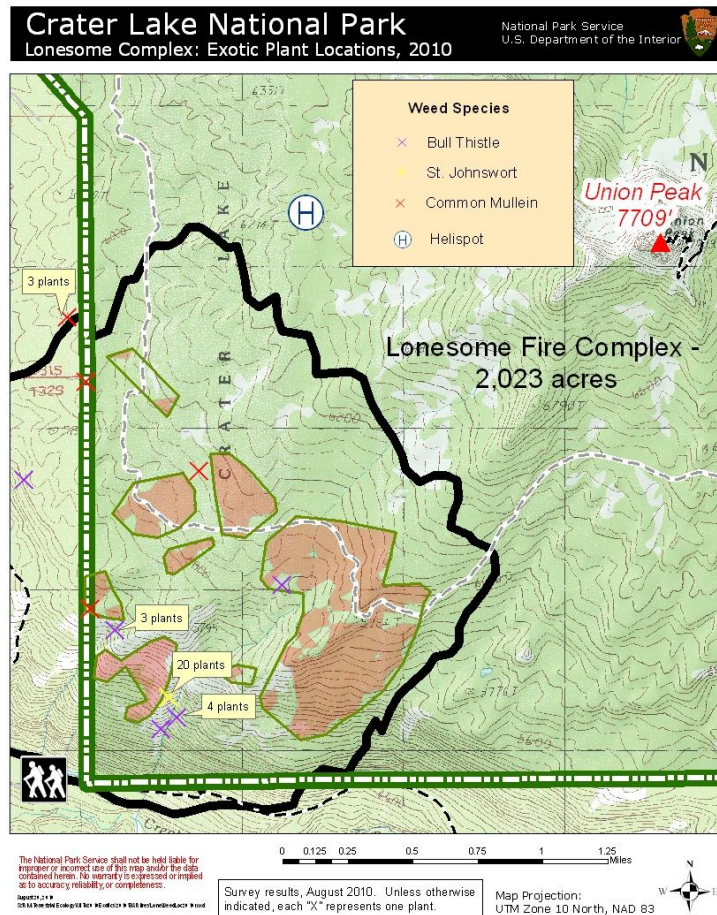


Figure 6. Results of 2010 weed survey.

Recommendations

Fortunately we found and pulled weeds from the Lonesome unit before they set seed. Recently burned areas create prime conditions (e.g., soil, light) for individual invasive plants to reproduce and develop into rapidly expanding weed patches. Additionally, the close proximity of Forest Service weeds will likely continue to influence the influx of new invaders in years to come. All weed species found on NPS land are also found less than a mile away on Forest Service land. To try and keep this area as weed-free of a gateway into the Park as possible, I recommend the following:

- Returning to known weed locations a minimum of once every two years to pull plants (bull thistle and mullein form rosettes their first year which would allow an additional year to wait until they bolt, flower and seed in their second year);
- Contacting Rogue River National Forest with our findings and discuss their strategies for exotic plants in this area;

- Conducting a boundary walk and pull to reduce new seed sources (there was significant logging up to the western boundary with many potential nooks in which weeds might be hiding); and
- Add “creeks” to the high-priority survey areas for 2011, as several weeds were found out of the high-priority survey areas and in drainages.

Certainly this project also highlights the need to conduct more fire area surveys, especially in the sizeable Bybee burn where a cursory look in August revealed some thistle in a seasonal drainage. There are many more acres to cover there, including a couple of spike camps and a helispot.

EXOTIC PLANT PROJECT SUGGESTIONS FOR 2011

The following are suggestions for 2011 weed-related activities.

- Follow-up to gauge success of NOCA herbicide treatments. *Estimated time needed:* Five days field, two days write-up.
- Review results of NOCA reports and data. *Estimated time needed* is unknown.
- Lonesome Burn Unit activities, year three of three-year project. *Estimated time needed:* Two persons, ten days.
- Organizing annual Hypper treatment with Vista through ODA. *Estimated time needed:* four days.
- Surveying South Pole Quarry, the south yard and Anderson Quarry for weeds, delineating and hand-pulling weedy areas and informing the Maintenance Division. *Estimated time needed:* two days.
- Annual driving survey of all main roads for new infestations. *Estimated time needed:* one day.
- Hand-pulling of weeds along roadsides and in high-visitor use areas. As needed.
- Hand-pulling weeds on Crater Lake shore until a comprehensive Lakeside Weed Management Plan can be established. *Estimated time needed:* Depending on the availability of research boat and number of assistants, from one to five days.